SF₆ has been widely used in the magnesium industry for more than 30 years. SF₆ is a highly-stable molecule—a major reason why it is such a concern for global warming as it can stay in the atmosphere absorbing solar radiation for 3,200 years. SF₆ has a global warming potential of 22,800, meaning that every ton of SF₆ avoided is equal to almost 23,000 tons of carbon dioxide reduced (which in turn is like taking 4,000 passenger cars off the road for a year).

Because of its stability and non-toxicity, SF₆ is used by magnesium die casters and recyclers to protect the molten metal from reacting with air. Without this protection, molten magnesium will oxidize and form magnesium oxide (MgO) deposits that greatly reduce the quality and strength of the final product. The cover gas stabilizes the MgO surface film to form a protective layer that prevents further oxidation.

Fugitive emissions of SF₆ are a byproduct of this process. For years, the magnesium industry has sought alternatives to SF₆, but other gases are either more expensive, have adverse health impacts, or are less reliable. As a result, almost all magnesium companies in the U.S. continue to use SF₆.

**Summary**

+ 3Degrees is seeking to help U.S. magnesium companies transition away from the use of sulfur hexafluoride (SF₆), a powerful greenhouse gas, to alternative cover gases.
+ 3Degrees seeks magnesium producers, die casters, and recyclers interested in exploring the technical and economic potential of this program.
+ 3Degrees is prepared to offer financing to support switching costs.
+ 3Degrees already supports one such successful project at Meridian Magnesium in Michigan.
Approach

With the support of its large base of voluntary carbon credit purchasers, 3Degrees helps magnesium producers, die casters, and recyclers switch to alternative cover gases. This is accomplished by using carbon credits to fund the cost of switching to more expensive cover gases. A process for registering new projects and quantifying the associated greenhouse gas benefit already exists and is open to all producers, die casters, and recyclers that use SF₆. And since carbon credits are measured in tons of CO₂ equivalent, relatively small amounts of SF₆ reduced translate into a large number of monetizable carbon credits. Facilities that use just a few thousand pounds of SF₆ per year could register as stand-alone projects. Users below that level might be grouped together under a single project listing to achieve certain efficiencies.

Process and Next Steps

As alternative gases have been technically and economically proven, 3Degrees is seeking to replicate and scale Meridian's success throughout the U.S. To accomplish this, 3Degrees and its technical partners are prepared to:

1. Assess the technical and economic feasibility of new SF₆ switching projects at no cost to the magnesium company.
2. Consider advances or prepayments against future carbon credits to finance the upfront and/or incremental cost of these projects.
3. Undertake all of the registration and verification work and expense necessary to generate carbon credits, making the process as easy as possible for the magnesium producer.

Case Study

Michigan-based Meridian Magnesium is a die caster that switched to sulfur dioxide (SO2) and a patented gas called Novec, which is more expensive. The incremental cost associated with this switch required Meridian to seek income from carbon credits. The company registered its project under the Verified Carbon Standard and has successfully sold every credit it has generated since. Meridian has been happy with the performance of both gases and the revenue from carbon credits has more than paid for the incremental cost.

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